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MOBILE & WIRELESS HEALTH

How Can Geography and Mobile Phones Contribute to Psychotherapy?

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Abstract Interdisciplinary relationships between Geography and Psychotherapy are an opportunity for innovation. Indeed, scientific works found on bibliographic databases and concerning this theme are scarce. Geographical sub-fields, such as the Geography of Emotions or Psychoanalytical Geography have started to emerge, theorizing about and interpreting feelings, emotions, moods, sufferings, of the chronically ill or diversified social groups and sites. But a less theoretical and more practical approach, in the sense of proposing, predicting and intervening, is lacking; as well as research into the possibilities offered by communication technologies and mobile phones. In the present work, we present the results of a review of the most relevant scientific works published internationally; we reflect on the contributions of Geography and mobile phones to psychosocial therapies and define the orientation and questions that should be posed in future research, from the point of view of geography and regarding psychotherapy. We conclude that the production of georeferenced data via mobile phones concerning the daily lives of people opens great possibilities for cognitive behavioural therapy and mental health. They allow for the development of personalized mood maps that locate the places where a person experiences greater or lesser stress on a daily basis; they allow for a cartography of emotions, a cognitive cartography of the places we access physically or through the Internet, of our feelings and psychosocial experiences. They open the door to the possibility of offering personalized psychotherapy treatments focusing on the ecological-environmental analysis of the places frequented by the person on a daily basis.

Keywords Geography · Psychotherapy · Mobile phones · Cognitive behavioural therapy · Psychoanalysis

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Introduction

In the present paper, we ask how Geography and mobile phones can contribute to psychotherapy, as part of a team project currently under development in the University of California - Berkeley School of Social Welfare. Our group of collaborative authors includes a geographer, a psychologist, a social worker and a computer engineer. We searched for previous investigation works and tried to identify related results in bibliographic databases and on the Internet.

Nowadays and on a global scale, according to data from the International Telecommunications Union [17], there are 96,8 subscriptions to mobile phones per 100 inhabitants; there are more mobile phones than people in developed countries (120,6 per 100 inhabitants) and almost one phone per inhabitant in developing countries (91,8 per 100 inhabitants). Mobile phones are quickly spreading all over the world and may become a universal communication tool between people. In Spain, there are 109 mobile phone subscriptions per 100 inhabitants and 80% of these gadgets are smartphones with Internet access ([9] y Fundación [27]).

A mobile phone can collect objective data for psychological and social assessments [1] but it needs to be perceived as a work tool by the professional and/or psychosocial therapist [14]. From the point of view of social intervention, social work professionals

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cannot be perceived as mere facilitators of information or managers of public subsidies; social work professionals need to orient their activity to achieve the biopsychosocial autonomy of those who are ill or at risk of exclusion [15]. Moreover, clinical psychology can be coordinated and supplemented with social work, creating methodologies for the prevention and/or rehabilitation of ill and/or excluded persons. In its turn, Geography can offer spatial analyses and context cartographies of the social and cultural environments in the daily lives of people, it can draw maps of their mental health, emotions, suffering, depression and anxiety; it can contribute to the biopsychosocial diagnosis of the patient. The potential of applying the results of interdisciplinary research among geographers, psychologists and social workers to psychosocial therapies is great. We are driven by the idea that Physical and Mental Health cannot be separated from Social Health.

Our objectives are as follows: (1) present the results of a review of the most relevant scientific works published internationally and identifiable in Internet-based academic databases with previously defined selection criteria (2) reflect on the contributions of Geography and mobile phones to psychosocial therapies (3) define the orientation and questions that should be posed in future research, from the point of view of geography and regarding psychotherapy.

Method

We defined keywords to find scientific papers studying the relationships between geography and psychotherapy using the Thomson-Reuters Web of Science databases, which include the Social Science Citation Index (SSCI), and we complemented this search with Academic Google. We covered the entire period of time allowed by the system, without chronologically delimiting the search that, according to the databases, can go back to the beginning of the twentieth century.

We used the keywords "geography", "psychotherapy" and "mobile phone" in English and "geografía", "psicoterapia" and "teléfono móvil" in Spanish; we carried out our research during the month of September 2016. We also used the English term "cell phone" instead of "mobile phone", as it is frequently used in the United States. Our queries in the Web of Science were carried in order to identify certain combination of these words or the presence of all of them in the title, theme or keywords identified by the author. We searched for scientific articles, books, conference and congress proceedings in all databases alike. We used the same terms in our Academic Google research but did not gather more information than the obtained with the Web of Science.

It is important to note that, in our research, we did not obtain any results including all three concepts, geography, psychotherapy and mobile phone, at the same time. On the other hand, we identified a significant, yet scarce, scientific production combining the concepts of geography and psychotherapy, all in the English language, and referring to papers published between 2005 and 2016; a number of North American medical magazines stood out, such as the Journal of Medical Internet Research and the journal of the Institute of British Geographers, Transactions of the Institute of British Geographers, as well as the journals Area and Social and Cultural Geography. Only two books were identified in our research, both by Editorial Ashgate in the United Kingdom: "Emotional Geographies", published in 2012 by Davidson, Smith and Blondi, authors who stood out for their works on the same subject in previously identified scientific journals; and "Psychoanalytic Geographies", published in 2014 by Kingsbury and Pile. We discovered that the first identified reference to geography and psychotherapy in the Web of Science dates from early 2005 and belongs to Liz Bondi, a social geography teacher in the University of Edinburgh, and also a psychologist and a psychotherapist. In Spain, we were unable to identify any bibliographic references on geography and psychotherapy. The only isolated reference was Capel [8] with a doctoral thesis on the location of schizophrenia in Granada.

On the other hand, we completed our scientific production research with a second effort developed during the month of December 2016. We searched the Internet through the Web of Science and Academic Google for articles whose titles included the concepts of: Cartography and Mood, Cartography and Vulnerability, Cartography and Mental Health, in English and Spanish, and found significant references in the United States regarding Mood Maps, and the Map of Vulnerability in Spain and in the United Nations, referred by the World Atlas of Health. Our search in the Web of Science focused on two specialized databases: Social Science Citation Index SSCI and Emerging Sources Citation Index ESCI.

Geography and psychotherapy much interpretation and little intervention

Therapy should be understood as a form of social intervention that seeks to improve the health of the patient. Psychoanalytic therapy need to be differentiated from cognitive behavioural therapy (CBT), which are not opposed but different in their methods; psychoanalysis is based on dialogue, in sessions of intense personal interactions between patient and psychoanalyst that try to analyse the unconscious and the origin of mental problems in order to understand them; cognitive behavioural therapy (CBT) seeks to modify negative behaviours in the daily life of the patient to improve mental health, and is based on the development and implementation of exercises, training or in learning healthy behaviours.

From the point of view of geographical science, direct bibliographical references to psychotherapy are scarce. Davidson and Milligan [11], Bondi [5], Thien [28] and Bennett [4] reflected on the connections between geography and psychotherapy; they questioned the relationship between geographic locations and human emotions and how they affect the environment around

them; they posed questions such as: where, in what place, are emotions felt? And are those emotions felt in the human body and in the geographical places at the same time? How are they conditioned and influenced? Davidson et al. [12] defined Geography of Emotions and presented a number of case studies that sought to locate the subjective feelings of people; for example, they investigated the places where cancer patients wished to die. Mackian [20] focused on mapping the spaces of reflexive modernity and its complex emotional landscapes, for which he interviewed chronically ill people in order to know the emotional geography of their daily lives. Geography and its connections with psychoanalysis have been the object of multiple reflections, analyses and investigations; Pile [25] theorized about emotions in relation to geography and its value for psychoanalysis, and proposed the study of affectivity and the emotional aspects of social and personal lives. More recently, Kingsbury and Pile [19] developed the concept of Psychoanalytical Geography with an interdisciplinary focus, where the concept of geography refers to the interpretation of social and cultural space, that is, a geography focused on the analysis of the unconscious, and tried to understand the relationships between geographic places and cultural, social, economic and environmental circumstances that lead to disorders, affections, psychological suffering or discomfort; Kingsbury and Pile [19] show how 25 researchers from diverse fields, including art, communication, geography, etc., tried to discover how psychoanalysis, the unconscious and Freudian theories can help understand geographical issues and how geography can offer new ways of psychoanalytic thinking; however, they do not accurately define their objectives or methods; of particular interest are their analysis of the geography of the unconscious, the psycho-geography of the city as a concentrator of dreams, the description and analysis of topographic and topological maps of trauma suffered by children in school or of the relationships among alcohol abuse, sex and the unconscious in the city of Las Vegas.

Kingsbury [18] and Curti et al. [10] reflects on the psychoanalytic methods of geography and contends that they are yet to be developed; he observes how the inductive method and poststructuralism characterize the therapies used with patients by psychoanalysts, who, through methods of "free association" of ideas, "analytic listening" or "empathy and identification," try to interpret and understand the unconscious of a patient and the origin of his phobias, traumas or mental disorders.

Therefore, analytical and descriptive theories and studies that evidence the relations between geography and cognitive behavioural and psychoanalytic psychotherapy exist. However, they need to move forward as questions concerning their usefulness arise; How can these concepts and knowledge improve mental health? Why have a relationship with communications and mobile phones not been established? How can the geographer move from interpreting and understanding social and cultural spaces to psychotherapeutic intervention, in order to prevent or treat mental health problems?

Geolocation and mood maps

Cartography of moods allows us to know and understand the relationship between geographical locations, their social context, and their implications or mutual connections with the feelings, affections, behaviours and experiences of people. Behavioural cognitive therapies (CBT) try to change behaviours that negatively impact physical, mental and social health and, in this ecological and environmental context, the potential for innovative psychotherapeutic intervention is significant. This emotional mapping is the object of interdisciplinary studies involving Artificial Intelligence and Psychology, in which mobile phones, mobile Apps, accelerometers and GPS systems constitute the key technologies for data production and collection [3, 20, 22, 26].

Morris [24] conducted a feasibility study targeting psychosocial therapies via mobile phones with an experimental group of 8 people diagnosed with symptoms of significant stress. For a month, these people were monitored from their phones, producing data on their moods during the day, checking for variations and respective geospatial references. With this, the researcher was able to study mood changes and their cycle throughout the day on a spatial level, mapping personal moods and their ecological-environmental analysis. With such maps, therapies can be designed and instant advice provided at the time and place in which the person suffers an emotional problem.

Similarly, Burns et al. [7] carried out a study of technical feasibility and functional reliability of a system of psychotherapeutic care via mobile phones and the Internet with a small group of 8 people displaying symptoms of depression, which lasted for 8 weeks, in the Center for Behavioral Intervention Technologies of the Nortwestern University of Chicago. From sensors on mobile phones, calls and text messages, they were automatically able to detect when and where a patient required assistance. In their study, like Morris [24], they showed how mobile phones can facilitate timely interventions in the environmental context and the specific place in which the patient needs help. They were able to develop custom mood maps, georeferencing colour points on google maps with the geographical coordinates provided by mobile phones, in an approximate prediction of future moods.

Mohr et al. [21] showed that patients suffering from depression preferred psychotherapy to drugs and that mobile phones eliminated access barriers, such as geographical distance, improving their participation and the psychotherapeutic treatment that served as a complement to the traditional "face to face". It is interesting to note that Dunton et al. [13] carried out an experimental study with a group of 39 teenagers in the United States and showed that certain sensors, such as accelerometers in mobile phones, allowed for the environmental evaluation of their activity in real time; their physical activity could be known during study, meal, or exercise hours, as well as their emotional responses to such physical activities and contextual

characteristics: place, social company, and purpose. In the USA, Asselbergs et al. [3] carried out an exploratory study with mobile phones to evaluate the day-to-day mood of a group of college students with minor depression symptoms; and they were able to evaluate, automatically and on a daily basis, the progress and regressions in personal moods.

Currently on the Internet, multiple Apps offer online therapy services against depression and anxiety; Mohr et al. [22] designed a complete information system called "Intellicare" through Internet Apps that allow online therapies for the treatment of depression and anxiety. Anyone can access them free of charge by downloading them on their mobile phone, but only with Android operating systems. This system offers monitoring and advice to prevent, manage and treat anxiety and depression, with daily automatic messages to the mobile phone. "Intellicare" was designed at the Northwestern University of Chicago with a grant from the United States National Institutes of Health and is still under development. People interested in receiving this "Intellicare" therapy authorize automatic access to their mobile phone data and location monitoring via GPS, Internet browsing, communications, etc.; they are also encouraged to participate with a direct compensation of $160. The production of geo-referenced data allows for the environmental and social context analysis of mood states. However, the viability and effectiveness of these intelligent therapy systems raise a number of questions if they are to involve vulnerable people with economic difficulties and scarce resources, poor user skills or limited access.

The available research has shown that the cartography of personal emotions facilitates psychotherapy, access and ubiquity, and overcomes barriers imposed by distance between patients and psychotherapists, providing a source of spatial data for mood maps where the connections between emotions and geographical places can be analysed, from an environmental, ecological, as well as social, point of view.

However, on a critical note, we should note that these feasibility studies were carried out with small experimental groups of university students and/or young adolescents with mild symptoms of depression or stress, or with people who were encouraged to participate. We can assume that these were groups of highly motivated volunteers, highly qualified in the use of the mobile phones; the question here is to what extent would this be possible for vulnerable people with different demographic, social, economic or cultural backgrounds. Is a mobile phone therapy service viable within a health system? Mohr et al. [21] state that primary care is the common ground for the treatment of depression and in their study, involving more than 300 patients in the United States, they found that the results obtained with cognitive behavioural therapies via mobile phones were not inferior to those obtained with classic face-to-face therapies. New research involving different locations and different social groups is needed in order to evaluate and improve the development of personalized mobile therapies.

Mobilyze and digital forensic analysis

There are tools for data collection and electronic detection; a Software for the acquisition, classification and analysis of data from electronic devices such as mobile phones with Windows, Android, Iphone/Ipad and MacOsx systems. These tools, used by forensic sciences to collect evidence and data in legal processes, can be valuable tools for Human Geography and Psychotherapy. This software, used by police forces and intelligence agencies around the world, shows great potential for social research and health. Among the most important are Mobilyze, from BlackBag Technologies, and Mobile Phone Examiner, by Access Data, developed in the San Francisco Bay and Silicon Valley.

This type of software can access data from any mobile phone and produce customized reports; data on voice and text communications, messages, contacts, etc.; data on social networks and social media, photographs, videos, messages on Facebook, Twitter, Linkedin, etc.; geo-referenced data from connected Wi-Fi networks and GeoTags, all synchronized with Google Maps; collect telephone contacts, addresses, messages, calls sorted by ranking, applications used, Internet history and respective productivity.

From a legal forensic research point of view, such software is applied in judicial or police investigation processes. But, would it be possible to adopt it in psychotherapeutic therapies? This would necessarily entail the authorization and informed consent of the patient. The type of data and reports provided without violating the privacy of the patient would be necessarily and clearly defined. But what type of patient are we talking about? What types of mental illness? Social and human behavioural researchers must bear in mind that mobile phones can read the moods of people through Wi-Fi, Bluetooth and GPS systems, producing real-time data on the environmental and social context of the patient. Processing this data allows for a continuous monitoring and advice of the patient by his therapist, in order to reduce symptoms of depression or anxiety in a specific moment and place.

In their research, Saeb et al. [26] recruited 40 volunteers with symptoms of depression, 28 of whom consented to be monitored via their mobile phones and to provide continuous geo-location data through GPS and their personal telephone use, during a period of 2 weeks. The authors were able to establish correlations between moods and frequented places in order to facilitate and predict therapeutic treatments; but the environmental analysis of the identified sites is lacking.

In this context, the question of how Geography can contribute to Psychotherapy arises; the available studies suggest that geo-referenced patient data can be produced, classified and interpreted spatially and environmentally in their contexts by the geographer. But again, more research and experimental studies are needed in this respect.

Atlas of vulnerability and maps of depression

Mobile technologies and experimental studies together with psychotherapy have been carried out with a particular focus on individual patient care. But is a community focus possible? How can the environment impact the mental health of a community?

The United Nations World Health Atlas states that the greater the social inequality and poverty the greater the risk of mental illness; there is a link between social vulnerability and mental health. In Spain, vulnerability has been mapped in a specific atlas, based on official data collected from the Population and Housing Censuses of 2001 and 2011 [16]. These censuses identified rural spaces, urban districts and municipalities with higher socioeconomic inequality and vulnerability levels. Statistical indicators of urban vulnerability, indices of inequality, and contextual social and demographic analyses have been developed, allowing for comparisons between cities, municipalities and regions [2, 15].

The United States Government developed a Depression and Mood Map from two phone surveys conducted between 1993 and 2001 and 2003–2006 to an estimated population of 2.4 million adults. The map shows the percentage of residents per county reporting a state of frequent mental distress, defined as an emotional distress experienced for 14 or more days in the month prior to the survey, including stress, depression and emotional problems. From this information, Moriarty et al. [23] analysed the "geography of despair" and found that communities and places with higher incomes and educational levels reported fewer cases of prolonged depression or stress.

In view of official statistical data, as is the case of Spain and the United States, more questions arise: can we think of individual and community psychosocial therapies customized for vulnerable urban neighbourhoods or rural areas? Can we geographically locate the places of despair? Can public statistical information systems provide customized data for community psychotherapeutic programs? The mobile phones can be used as instant statistical information tools [6] but can they be used as geo-located psychotherapeutic intervention tools?

Our observation of basic territorial statistical units in the North American and Spanish censuses allows us to observe the production of geo-referenced data on different scales. In the United States, the smaller territorial statistical units are the called "census tracts", which may be urban or rural, and are designed as a subdivision of the county; they involve an average of 4000 inhabitants and officially delimit homogeneous geographical areas respecting the limits of cities, towns and urban or rural settlements in general; census tracts offer data concerning social, cultural, economic, and lifestyle characteristics. In the case of the Spanish territory, the smallest statistical units that offer data similar to the "census tracts" are the municipalities; these, unlike the census tracts, are not homogeneous units and their size varies from a few hundred to millions of inhabitants, not delimiting cities, towns, urban or rural settlements. Municipalities include smaller census areas, such as electoral districts, parishes or census areas, but they do not offer comparable data because they are not statistically treated, the Data Protection Law does not allow it, or the only information they offer is the number of inhabitants. Therefore, there is a production of geo-referenced data in the Population Censuses of the United States and/or Spain that could be a source of information for the analysis of contexts, environments, places of residence in the daily lives of people suffering from depression, stress, or mental illness in general. This opens the door to investigation and experimental studies.

Conclusion

Emotions and human behaviour are contextual and territorial, and influenced by physical and social environments. It is important to understand that age, gender, education, migration, geographical mobility, activity and socioeconomic conditions in a vulnerable environment affect the psychological state of people and their use of health services. Urban or rural pathologies, such as excessive noise, congestion, money use, interpersonal relationships, isolation or loneliness, generate anxieties that in certain circumstances lead to mental problems. The production of georeferenced data via mobile phones concerning the daily lives of people opens great possibilities for cognitive behavioural therapy and mental health. They allow for the development of personalized mood maps that locate the places where a person experiences greater or lesser stress on a daily basis; they allow for a cartography of emotions, a cognitive cartography of the places we access physically or through the Internet, our feelings and psychosocial experiences. They open the door to great possibilities of offering personalized psychotherapy treatments focusing on the ecological-environmental analysis of the frequented by the person on a daily basis. The dissemination of mobile phones on a global scale allows us to overcome access barriers to face-to-face health services and generate detailed data about daily lives, bringing psychotherapy and mental health to remote areas, rural areas and city spaces that are socially marginalized at risk of vulnerability.

Geography of Emotions and Psychoanalytical Geography must move from theory to practice and provide spatial data and geo-referenced information that is useful for therapeutic treatments and mental health; they can develop mood maps with geo-localization systems, and develop advanced atlases of mental illness, suffering, depression and anxiety; but they can also collect, classify, organize and produce spatial data on places, vulnerable spaces, and the daily spaces of people suffering from mental disorders. The debate of how and for whom is opened. Is community therapy targeting vulnerable communities, geo-located in specific places, possible? The technology of mobile communications and smart phones can overcome geographical barriers and the distance between

patient and therapist, allowing for instant intervention, advice and accompaniment, at the right time and in the right place. This paves the way for interdisciplinary investigation.

Geography can bring new forms of social intervention to the therapeutic practice, improving the health of the patient. But the alliance between geography and psychotherapy cannot ignore the use of mobile phones and artificial intelligence as an intervention tool and as key devices for data production. The diagnosis of the patient can rely on spatial analyses and the cartography of the places that may improve his geography.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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